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सं0 ईएल/2.2.1 दिनॉक 29.03.2012

मुख्य विद्युत अभियंता,

- मध्य रेलवे, मुम्बई सीएसटी –400 001
- उत्तर रेलवे, बड़ौदा हाऊस, नई दिल्ली–110 001
- उत्तर मध्य रेलवे, ब्लाक ए–2, सुबेदारगंज इलाहाबाद – 211 033
- पूर्व रेलवे, फेयर्ली प्लेस, कोलकाता–700 001
- पूर्व–मध्य रेलवे, हाजीपुर–844 101
- पूर्व तटीय रेलवे, चन्द्रषेखरपुर, भुबनेश्वर–751 023
- दक्षिण रेलवे, पार्क टाउन, चेन्नई–600 003
- दक्षिण मध्य रेलवे, रेल निलायम, सिकंदराबाद–500 371
- दक्षिण पश्चिम रेलवे, हुबली–580024
- दक्षिण पूर्व रेलवे, गार्डेनरीच, कोलकाता–700 043
- दक्षिण पूर्व मध्य रेलवे, बिलासपुर – 495 004
- पश्चिम रेलवे, चर्चगेट, मुम्बई– 400 020
- उत्तर पश्चिम रेलवे, जयपुर-302006
- पश्चिम मध्य रेलवे, जबलपुर–482 001
- चित्तरंजन रेल इंजन कारखाना, चित्तरंजन – 713331

विषयः स्पेशल मेंटेनेंस इंस्टक्शन सं. RDSO/2012/EL/SMI/00274 Rev. '0' दिनॉक 29.03.2012.
संदर्भः इस कार्यालय के दिनॉक 29.03.2012 का समसंख्यक पत्र ।

उपरोक्त विषय पर इस कार्यालय के दिनॉक 29.03.2012 कासमसंख्यक पत्र आपके सूचना एवंआवश्यक कार्रवाई हेतु संलग्न है ।

(ए. के. गोस्वामी)
कृतेमहानिदेशक/विद्युत

संलग्नक : यथोक्त ।

प्रति :

1. सचिव (विद्युत), रेलवे बोर्ड, रेल भवन, नई दिल्ली–110 001 (निदेषक विद्युत (चल स्टॉक) के ध्यानाकर्षण हेतु)
2. सचिव (विद्युत), रेलवे बोर्ड, रेल भवन, नई दिल्ली–110 001 (निदेषक विद्युत (चल स्टॉक) के ध्यानाकर्षण हेतु)
3. मुख्य विद्युतलोकोअभियंता
   - मध्य रेलवे, मुम्बईसीएसटी–400 001
   - पश्चिमरेलवे, चर्चगेट, मुम्बई–400 020
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   - पूर्वरेलवे, फेयर्लीप्लेस, कोलकाता–700 001
   - पर्वतटीय रेलवे, चन्द्रषेखरपुर, भुवनेष्वर–751 016
   - पूर्व–मध्य रेलवे, हाजीपुर–844 101
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   - दक्षिणरेलवे, पार्कटाउन, चेन्नई–600 003
   - दक्षिण मध्य रेलवे, रेलनिलायम, सिकंदराबाद–500 371
   - दक्षिणपश्चिमरेलवे, हुबली–580024
   - दक्षिणपूर्व मध्य रेलवे, बिलासपुर–495 004
   - उत्तररेलवे, बड़ोदाहाऊस, नई दिल्ली–110 001
   - उत्तर मध्य रेलवे, हास्टिंगरोड, इलाहाबाद–211 001
   - उत्तरपष्चिमरेलवे, जयपुर–302 006
   - चितरंजनरेलइंजनकारखाना, चितरंजन–713 331

वरि. मंडलविद्युताअभियंता/टीआरएस/ विद्युतलोको शेड

- पश्चिम मध्य रेलवे, न्यूकटनीजंक्शन, कटनी (मध्य प्रदेश)–483503
- पश्चिम मध्य रेलवे, इटारसी (म.प्र.)–461115
- पश्चिमरेलवे, वलसाड–396 001
- दक्षिणरेलवे, अरकोनम–631 001
- दक्षिणरेलवे, इरोड–638 002
- दक्षिण मध्य रेलवे, लालागुडा, सिकंदराबाद–500 017
- दक्षिण मध्य रेलवे, काजीपेट, जिला–वारंगल (ऑध्रप्रदेश)–506003
- दक्षिण मध्य रेलवे, विजयवाड़ा–520 009
- दक्षिणपूर्वरेलवे, टाटानगर–831 002
- दक्षिणपूर्वरेलवे, सांत्रागाची, हावड़ा–711 311
- दक्षिणपूर्वरेलवे, बन्डामुन्डा, राउरकेला–770 032
- दक्षिणपूर्वमध्यरेलवे, बीएमवाईकाम्पलेक्स, भिलाई दुर्ग–490 025
- मध्य रेलवे, अजनी, नागपुर–440 008
- मध्य रेलवे, भुसावल–425 201
- मध्य रेलवे, कल्याण (महाराष्ट्र)–421301
- पूर्वरेलवे, हावड़ा–711 101
- दक्षिणरेलवे, रायपुरम, चेन्नई–631 001

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   - विद्युतलोकोवर्कषाप, पूर्वरेलवे, कचरापाड़ा, 24 परगना (उत्तर)–743 145 (प.बं.)
   - विद्युतलोकोवर्कषाप, मध्य रेलवे, भुसावल–425 201
   - कर्षणमोटरवर्कषाप, मध्य रेलवे, नासिक–422 101
   - लोकोकैरिज एण्ड वैगलवर्क्स, पश्चिमरेलवे, दाहोद, डाक–फ्रीलैंडगंज–389 160 (गुजरात)
6. वरि. मंडलविद्युतअभियंता / टीआरएस / विद्युतलोको शेड
- पूर्व मध्य रेलवे, मुगलसराय–232 101
- पूर्व मध्य रेलवे, गोमो–828 401
- पूर्वरेलवे, आसनसोल–713 310
- पूर्वतटीय रेलवे, विषाखापत्तनम–530 001
- उत्तर मध्य रेलवे, फजलगंज, कानपुर–208 003
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- उत्तररेलवे, लुमिग्याना (पंजाब)–141001
- उत्तर–मध्य रेलवे, झांसी–284 001 (उ.प्र.)
- पश्चिम मध्य रेलवे, तुगलकाबाद, नई दिल्ली–110 044
- पश्चिमरेलवे, बडोदरा–390 002

6. वरि. मंडलविद्युतअभियंता
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7. उप मुख्य विद्युतअभियंता, पी.ओ..एच. शाप / लोकोवर्क्स
- चारबागवर्कशॉप, उत्तररेलवे, लखनऊ–226 005
- पीओएचशॉप, दक्षिणपूर्वरेलवे, खड़गपुर (प.बं.) 721 301
- पीओएचशॉपदक्षिणरेलवे, पैराम्बूर, चेन्नई–600 038

8. मंडलविद्युतअभियंता, विद्युतरिपेयर शाप, टाटानगर–831002
9. कार्यकारीनिदेषक (निरीक्षण विद्युत), अ.अ.मा.स. निरीक्षणप्रकोष्ठ द्वाराबीएचईएल, पिपलानी, भोपाल–462 022
10. कार्यकारीनिदेषक, कैमटेक,भारतीय रेल, महाराजपुर, ग्वालियर–474 020 (म.प्र.)
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12. महानिदेषेक (प्रिंसिपल) रेलवेस्टॉफकालेज, बडोदरा–390 004

आपके सूचना एवं आवश्यक कार्रवाई हेतु संलग्नहै ।

(ए. के. गोस्वामी)
कृतेमहानिदेशक / विद्युत

संलग्नक : यथोक्त ।

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No. EL/2.2.1 Dated 29.03.2012

Chief Electrical Engineer,
- Central Railway, Mumbai CST- 400 001.
- Eastern Railway, Fairlie Place, Kolkata- 700 001
- East Cost Railway, Chandrashekharpur, Bhubaneshwar- 751 016.
- Northern Railway, Baroda House, New Delhi-110 001
- North Central Railway, Hasting Road, Allahabad-211 001.
- Southern Railway, Park Town, Chennai-600 003
- South Central Railway, Rail Nilayam, Secunderabad –500 071
- South Eastern Railway,Garden Reach, Kolkata -700 043
- South Western Railway, Hubli.-580024
- Western Railway, Churchgate, Mumbai–400 020
- West Central Railway, Jabalpur-482001
- South East Central Railway, Bilaspur-495004
- East Central Railway, Hazipur-844101 (Bihar)
- North Western Railway, Jaipur-302006.
- Chittaranjan Locomotive Works, Chittaranjan- 713 331

SPECIAL MAINTENANCE INSTRUCTION NO. RDSO/2012/EL/SMI/0274, REV. '0' dated 29.03.2012

1. Title :

Preventive measures to check flash over of roof insulators and roof line fittings of electrical locomotives.

2. Brief History :

Railways have reported flashing on locomotive roof causing failure of locomotives. It has been reported that flash over has taken place between roof bar & roof and also between top metal cap & bottom metallic portion of panto mounting insulator / roof of locomotives. The initial failures were concentrated in MGS division of ECR. However, soon few cases were also reported from NCR & SER also.

3. Observations:

Few locomotives withdrawn from line due to flashing of roof insulators were checked at MGS & CNB electric loco sheds. Observations are as under:

- Flash-over were noticed between roof bar & roof of locomotive & flashing has taken place not through the shortest path.
- Multiple flashing was also noticed on the top metal cap and bottom metallic base plate of panto mounting insulator / roof of locomotive without participation of sheds of insulators as no creepage was observed.
- Though the affected insulators were found contaminated but middle sheds of insulators were not involved in flash-over.
- It was also observed that the top shed of panto mounting insulators has marks of flashover and there was no flash-over on the middle sheds. This is the most common phenomenon seen in several locomotives. It is due to either the top shed has tracked due to contamination and led to flashover, or it came in the path of flashover. Losing top shed of panto mounting insulator further reduces the dry arc distance or electrical clearance to around 200 mm.
- Tracking has been seen in most of the cases involving HOM.
- The upper shed of panto insulator was found painted in few cases which have eroded the glazed surface of the insulator.
- Old flash marks & dry bands were also observed on the few insulators. Anti-tracking paint was applied to cover up the damaged glaze.
- In one insulator, sheds were broken and painted with red oxide paint.

4. Failure analysis:

- It was reported that in most of the cases the flashing has occurred at early hours in the morning between 0330 hrs to 0520 hrs when the

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- Multiple flashing was also noticed on the top metal cap and bottom metallic base plate of panto mounting insulator / roof of locomotive without participation of sheds of insulators as no creepage was observed.
- Though the affected insulators were found contaminated but middle sheds of insulators were not involved in flash-over.
- It was also observed that the top shed of panto mounting insulators has marks of flashover and there was no flash-over on the middle sheds. This is the most common phenomenon seen in several locomotives. It is due to either the top shed has tracked due to contamination and led to flashover, or it came in the path of flashover. Losing top shed of panto mounting insulator further reduces the dry arc distance or electrical clearance to around 200 mm.
- Tracking has been seen in most of the cases involving HOM.
- The upper shed of panto insulator was found painted in few cases which have eroded the glazed surface of the insulator.
- Old flash marks & dry bands were also observed on the few insulators. Anti-tracking paint was applied to cover up the damaged glaze.
- In one insulator, sheds were broken and painted with red oxide paint.

4. Failure analysis:

- It was reported that in most of the cases the flashing has occurred at early hours in the morning between 0330 hrs to 0520 hrs when the

atmospheric temperature was minimum & relative humidity was very high and there was no wind. Further, flash-over has taken place at low speeds as indicated by loco pilots in log book of affected locos.

- The pattern of flashing shows that there were multiple spots over the charged electrical components and the roof surface.
- The most of the failures have taken place in MGS division of ECR during foggy weather. It was due to highly unusual weather phenomenon. The MGS-DOS section runs almost parallel to NH-2. This road is witnessing lot of earth work due to addition of extra lanes. There are lot of construction activities going on in the area surrounding Dehri On Son in addition to new stone crushers and a cement plant. These are all new activities that picked up only recently, which are probably main cause of sudden rise in pollution levels in that area. In the absence of wind the pollutants in the fog form conductive path which when comes in contact with live part & roof led to flashovers.
- Such flash-overs have taken place in the past also as anti-tracking paint / dry bands/ old flash mark were also seen on the sheds of insulators in locomotives. It is a practice in locomotive maintenance to apply this paint whenever, a glaze is found damaged due to arcing. However severity of flash over were not too high. During this season severity of flash over has increased due to increased level of pollution.
- Failures of HOM insulators have taken place due to flash-over between between mounting bracket of HOM's fixed contact and its support insulator bottom metallic portion through contaminated sheds of HOM insulators. Investigation revealed that the design of mounting bracket of HOM's switch fixed contact is such that it overlaps top 02 sheds of the support insulator and reduces electrical clearance. The flash has jumped on IIIrd shed of HOM insulator from the tip of mounting bracket of HOM fixed jaw and tracked through the other sheds of

insulator. The mixture of pollutants that existed on the surface of HOM insulator and humidity of the fog form a layer that became conductive and allowed passing leakage currents. This may be the reason of failure of HOM insulators.

- On the basis of analysis of the flashing patterns, it is observed that flashing on the locomotive has taken place due to conductive fog & in some cases due to contamination of porcelain insulators surface as well.

5. Object:

There is need to adopt certain minimum maintenance practices during trip inspection and maintenance schedule of locomotives so that proper attention is given to panto mounting insulators and roof line insulators/ fittings to avoid flash-overs. This SMI recommends preventive actions to be taken to avoid such cases. It will supersede SMI No. RDSO/ELRS/SMI/110A issued in 1984.

6. Preventive action to be taken:

It is worth mentioning that contamination over the surface of insulator facilitates in flash-over during foggy/ misty atmospheric condition and also during initial drizzling. On the basis of failure analysis of flashed insulators and shortcoming noticed in maintenance practices, it is recommended that following measures are to be taken to avoid re-occurrence of such failures:

6.1 To ensure cleaning of roof insulators in every trip inspection and schedule inspection.The underneath of the sheds to be cleaned as well.

6.2 Clean all the roof-line and pantograph insulators externally with a wet cloth and finally rub them dry. Use detergent for cleaning, if

necessary to remove all adhered contamination & to provide the surface the nice original gloss.

6.3 Check the general condition of the insulators and look for visible cracks, unglazed surface/ dry bands and old flash marks. Replace the insulator, if any defect is noticed.

6.4 Apply Silicone oil to increase the hydrophobicity of insulator porcelain surface after cleaning:

6.4.1 Hydrophobicity is the property that prevents water from forming a sheet on the surface. In a hydrophobic surface, the water is placed in shape of remote drops. A thin layer of silicon oil, when applied on the surface of insulators increases the hydrophobicity of surface. It prevents the formation of a continuous film of water, which is the main responsible factor of the flashover on the contaminated surface of the insulator. Pollution particles that are deposited on the insulator surface are encapsulated by oil and protected from moisture. It is to be removed and re-applied in every inspection. It will also help in maintaining the surface gloss.

6.4.2 A thin layer of silicon oil is to be applied on the panto mounting and roof line insulators during each schedule inspection to make them hydrophobic and immune to bad weather related tracking. The insulators are to be wipe-cleaned in trip inspection. A thin film of silicone oil will remain intact on the surface even after cleaning by dry cloth during trip inspection. During next schedule inspection, silicone oil is to be re-applied after proper cleaning of insulators.

6.4.3 Silicon oil (Base- Silicone fluid & Composition- Polydimethylsiloxane) may be procured in aerosol from following sources:

1. M/s. AVI-OIL India Pvt. Ltd(AVI LUBE S-40)
2. M/s 3M (Silicone lubricant 1609)
3. M/s Dow Corning (Xiameter PMX-200 Silicone fluid 350cst).
4. M/s. Matrix speciality lubricants (Silcon 20-300.000, 350 cst)

6.5 All the sharp edges of roof bar connections and fittings are to be round-off as per sketch enclosed as annexure-I.

6. Application to :

All types of electric locomotives.

7. Agency of Implementation :

All POH Shops, Workshops & Electric Loco sheds.

8. Periodicity of application of silicone oil:

8.1 One thin coat of silicone oil to be applied to all the insulators before the onset of winter i.e. before November.

8.2 Repeat application of silicon oil during every inspection upto March.

8.3 Clean insulators in every trip inspection. Examine whether silicon oil coat is intact or not, otherwise follow instructions given in para6.1 to 6.4 above.

9. Reference :

9.1 Railway board letter no 2011/Elect.(TRS)/155/1 dated 08.12.2011.

9.2 Discussion in CEEs conference held in Baroda House/ NR/ New Delhi on 17.12.2011

9.3 Trial done on loco no 22656 of ELS/GZB/NR at New Delhi Trip shed on 14.12.2011.

(A.K.Goswami)
for Director General/Elect.

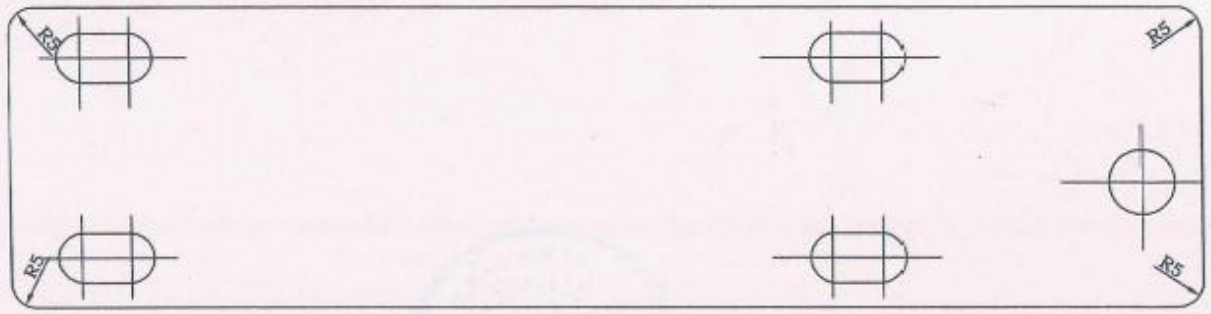
Encl: As above

Copy to : As per standard mailing list no. EL/M/0019

PIN

(A.K.Goswami)
for Director General/Elect.

Encl: As above



ALL THE ROOFLINE PLATES AND FITTINGS SHARP EDGES TO BE REMOVED

DT	14.12.11
D	VKYADAV
C	MOMAHANT

REVISION	DATE	DESCRIPTION

REF : RDSO/2012/EL/MS/0404 (REV.'0'), Dated 03.01.2012 | SCALE: NTS | APPD.BY (FOR DG)

PLATES OF ROOFLINE ARRANGEMENT

RDSO ELECT. DTE

SKEL 4875, Alt.'0'

FIRST ISSUED

SUPERSEDES

SUPERSEDED BY

ANNEXURE-I